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ABSTRACT

This booklet, one in a series entitled "What Research Says to the Teacher," deals with physical fitness. The initial section discusses what physical fitness is and what its characteristics are. Section two details various aspects of physical fitness and its relation to mental health. The remainder of the document discusses briefly the need for physical fitness, aspects of measurement techniques, and prerequisites to physical well-being. Age-related activities for various physical needs are also suggested. A list of physical fitness tests and measures are included. (JB)

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WHAT RESEARCH SAYS TO THE TEACHER

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Physical Fitness

Paul Hunsicker

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is published to provide classroom teachers and prospective teachers with concise, valid, and up-to-date summaries of educational research findings and their implications for teaching.

Each pamphlet in the series is designed to serve two prime functions: to suggest principles and practical procedures that may be applied directly by the classroom teacher and to provide a springboard for further study and use of research findings.

To serve the first purpose, authors of booklets in the series select from each field those research findings that promise to be of most help to the classroom teacher. However, research has not yet provided scientifically valid findings on many aspects of teaching. In such cases, the best that can be offered is expert opinion.

It is impossible, of course, to provide a complete summary of research in any field in 32 pages. To help teachers further explore research findings, selected references are listed at the end of each booklet in the series.

The series was initiated in 1953 by the Department of Classroom Teachers (now Association of Classroom Teachers) and the American Educational Research Association under the leadership of Frank W. Hubbard, in his capacities as director of the Research Division, secretary-treasurer of the AERA, and assistant executive secretary of the NEA. Beginning in 1966, the Department of Classroom Teachers assumed full responsibility for publication of the series, with the assistance of the NEA Publications Division. One measure of the success of the series is the use of approximately two million copies of the booklets by educators in the United States and throughout the world.

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SIDNEY DORROS, *Series Editor*

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Physical Fitness

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EXPLANATION

The author of this pamphlet, Paul Hunsicker, is chairman of the Department of Physical Education, The University of Michigan. He has drawn upon research material that offered possibilities of being most helpful to classroom teachers. It is not a complete summary of research. In some instances, opinion has been given which is believed to represent the views of most experts. The interpretation and recommendations are those which the author believes to be soundly supported by research. The original manuscript was reviewed by several members of the staffs of the American Association for Health, Physical Education, and Recreation (NEA) and of the NEA Information Services.

PHYSICAL FITNESS

THE PROBLEM of physical fitness or a lack of physical fitness in youth is by no means new to this generation. Statements deploring the lack of physical fitness in our country have appeared periodically since the days of the American Revolution. These complaints stem partly from the almost universal habit of the older generation of thinking of the younger one as slipping toward lower levels. The situation is invariably brought into sharp focus during times of national stress, and, with every war, articles appear in popular literature pointing to the lack of fitness. Then, too, the nationwide surveys of the physical status of the young adult males during a war period provide precise figures of the number accepted or rejected for military service. These surveys make "good copy" for the press.

While draft rejection figures are fairly objective and often discouraging, we must recognize the lack of comparable data for different generations of American youth. Without comparisons with the past, however, we still should face the numerous disquieting reports on fitness during the past decade. The behavior of a few American prisoners of war in Korea and the death rate during the war left much to be desired. The military analyst, Marshall, alludes to the weakness of the legs of the American troops in Korea in his book, *Pork Chop Hill*. In a comparison between British and American boys and girls on the American Association for Health, Physical Education, and Recreation Youth Fitness Test, the average score for British youngsters was 14 percentile points above the American average (American, 50th percentile; British, 64th percentile). If the softball throw were taken out of the British battery (since the British do not play softball), the average British score would be at the 70th percentile level. Analyses of the results show the British youngsters as having greater shoulder girdle strength, superior agility, greater abdominal strength, more leg explosive power, and more endurance. The comparison between the British girls and the American girls was even more favorable toward the British, since the average score for the British girls was at the 73rd percentile. Similar comparisons with Japanese children were equally disquieting.

A research study, indicating a failure rate on a minimum muscular fitness test of approximately 58 percent by American children in contrast to a failure rate of approximately 9 percent by Austrian, Italian, and Swiss children, was a strong factor in the creation of President Eisenhower's Youth Fitness Council.

Studies at representative colleges and universities indicate that today's freshman is not as physically fit as those of yesteryears. Some critics may be justified in pointing out weaknesses in research design and, in particular, the selection of samples, but let no one forget that the only studies comparing today's youth favorably with those of the past are concerned with height and weight. In all studies where *physical performance* was investigated, today's youth fell short. One may ask, "Is this situation necessary?"

We do find one comforting thought: namely, when present-day youngsters are challenged and trained, as they are in competitive sports, their performance surpasses that of their parents and grandparents. As evidence, consider the records broken in the 1960 Olympics. In practically every Olympiad since the start of the modern Olympics in 1896, the same trend has persisted—new records were established. We can expect this trend to continue in the 1964 games. Apparently, then, the potential for high-level fitness is present in our young people, and, with proper motivation, superior levels of physical fitness can be attained.

WHAT IS PHYSICAL FITNESS?

The term "physical fitness" has been used to denote many things and, as a result, has created confusion in the public mind as well as in professional ranks. The lack of a clear-cut, precise definition serves as a stumbling block when actually it need not be one. Engineers did marvelous things with electricity without knowing precisely what it was. But perhaps it will help to look at some of the interpretations of physical fitness currently in use.

Fitness as Freedom from Disability and Disease

The armed forces generally consider a man physically fit for service if he is free from any pathological condition and devoid

of any physical disability. This definition is quite different from the one held by professional physical educators. While the former takes no cognizance of the state of *training* of the individual, the physical educator has taken a keen interest in this aspect of the subject. In physical education, "freedom from disease" is a point of departure for building up physical fitness through a training program.

Fitness as Capacity To Perform and To Recover

One definition used by physical educators has been stated: "Fitness consists in the ability of the organism to maintain the various internal equilibria as closely as possible to the resting state during strenuous exertion and to restore promptly after exercise any equilibriums which have been disturbed." In other words, the fit individual will be less embarrassed, physiologically speaking, than the unfit individual when both are given the same task, and, furthermore, the fit individual will recover faster from the task than the unfit. While this point of view has definite limitations, it has been used as the underlying logic behind many tests of physical fitness.

Fitness as Available Energy

Physical fitness in terms of available energy sometimes is called "biodynamic potential." The fit person is capable of performing prolonged work. He can meet the physical demands of his daily routine and possesses sufficient reserve for additional activities. The unfit becomes so fatigued that he cannot enjoy any additional activities.

The thought that through *energy expenditure* the individual builds up more potential energy should interest every adult. The acquisition and maintenance of energy reserves is one of the key factors in the whole physical fitness problem. Living a full life demands more than just staying alive, and nothing is quite as pathetic as the old person with insufficient energy reserve to enjoy life. Physical effort and health are means whereby we acquire the extra energy associated with a high state of fitness.

Other Characteristics of Fitness

Studies in the physiology of exercise that have been designed to assess differences between fit and unfit individuals usually advance the following characteristics of the fit individual:

1. A lower resting pulse rate
2. A lower oxygen consumption for the same work output
3. A larger stroke volume of the heart (more blood ejected per contraction)
4. A faster return to normal of blood pressure and heart rate after exercise
5. A capacity of displacing physiological equilibria further and for a longer time
6. An ability to perform greater amounts of work.

Other attempts to define physical fitness introduce the concept of survival or fitness for a specific task. Certainly everyone can recall hearing or reading accounts of survival where a high level of physical fitness meant the difference between the person's being around to relate the incident or being a name on a casualty list. An example in this connection is related to President Kennedy's World War II experiences on a PT boat. If the President, then a naval officer, had been a poor swimmer or a nonswimmer and had been in poor physical condition, his chances of survival would have been nil. The number of similar incidents is legion during most wars.

A recent example of physical fitness related to a particular task is the program of selecting and training American astronauts before sending them on orbital flights. The scientists and other specialists planning this program, so demanding in top human performance, could not risk giving the assignment to someone who was physically unfit.

MANY FACTORS IN PHYSICAL FITNESS

The subject of physical fitness has many ramifications, and the classroom teacher interested in this subject needs to become aware of many aspects. The following paragraphs, particularly germane and pertinent to the topic, should be helpful. Physical fitness is composed of many components and attributes. A par-

tial list would include body strength, muscular endurance, agility, cardiorespiratory efficiency, speed, balance, and flexibility.

Factors Not Necessarily Interrelated

While everyone possesses agility, strength, and other characteristics to some extent, individuals may have a high degree of one component and a relatively low degree of another. In other words, the interrelationships between components of physical fitness may not be particularly high. This is analogous to saying that a person may have a defective digestive system and still possess an efficient brain. Obviously, the most fit person is the one who has the greatest number of desirable qualities in the largest quantity.

The fact that the components of physical fitness are different and not necessarily related has caused confusion in attempts to measure fitness. For example, one test may measure a few characteristics while another measures other qualities, yet both are called "fitness tests." Statistically the relationship between the two tests will be of a low order. Additional comments on this point will be offered under another section of this pamphlet.

Physical Fitness Status Improvable

A second important concept is that physical fitness exists in varying degrees, and practically any person can improve on his present state. You may think of one person who is just above the "freedom from disease" level at one end of a scale and, at the other extreme, the Olympic distance runner. An individual can be placed on this scale largely as a reflection of the amount of training he has been exposed to. The important point for the teacher is that practically all students can improve their status if they are willing to exert the energy.

Fitness Requires Physical Activity

While food provides the chief basis of energy, to raise the energy potential of an individual, he must *expend* energy. One does not train a marathon runner by giving him more food. *You run him.* A well-conditioned athlete does not arrive at that

state merely by eating more food and thinking about fitness. There is no "royal road" to top-flight physical condition, and everyone who aspires to a higher level of fitness must be prepared to pay the price of expending additional energy. The key to greater energy reserve is through energy expenditure. The training regimes of distance runners, paratroopers, and infantry rangers are strenuous so as to condition them for the tasks ahead. Every single program has one common factor, namely, a high expenditure of human energy.

Fitness Not Permanent

Good physical condition can be transitory in nature, and the high school athlete of today can be quite unfit tomorrow if he abandons an exercise regime. This transitory tendency is particularly true of components of fitness involving endurance or cardiorespiratory efficiency. In fact, it has been demonstrated that, in a month of inactivity, a basketball player will revert to his preseason level of fitness as shown by selected tests of cardiorespiratory efficiency. You can readily imagine what occurs when the athlete abandons sports participation upon graduation. His fitness level as an adult will be no better than that of any nonathlete. The teacher should recognize this and should constantly strive to impress young children with the need for physical activity throughout life.

Physical Fitness Related to Mental Fitness

Reflecting on the transitory nature of many of the components of physical fitness reminds us of the cardinal importance of developing wholesome attitudes toward sports participation. In the long run, the individual will be fit or unfit, depending to a large extent on the priority which physical fitness occupies in his personal value system. Those who are convinced of the value of a high level of physical fitness will take the time and spend the energy necessary to attain and retain fitness. This is the crux of the entire physical fitness problem. The individual's value system must include physical fitness at a high point in the scale. Willingness of the individual to consider the facts and make a decision makes a close link between physical and mental fitness.

Although there is some relationship between mental and physical fitness, persons can be extremely high on one scale and low on the other. Physical fitness is largely concerned with the acquisition, maintenance, and expenditure of energy. Simply defined, mental fitness is concerned with evaluation and decision making. If an individual's action following the decision is in line with socially accepted customs, we consider him mentally fit. If the action runs counter to accepted practices, we think of him as mentally unfit. Most of us can readily remember people who would be rated high in physical fitness and low in mental fitness, low in physical fitness and high in mental fitness, or high in both. Obviously, a high level of both is the most desirable state and the objective which teachers should seek to teach.

Fitness a Lifelong Possibility

While physical fitness may be highest during a relatively few years of a person's life, it should be emphasized that age alone is not the determining factor. Training is of far greater importance, and it is a matter of record that some athletes have remained active well beyond middle age. Many of us recall, for example, such athletes as Walter Johnson, Bill Tilden, Satchel Paige, and Jim Thorpe who corroborate this fact. The chief carrier for the first successful climbing of Mount Everest was 50 years old at the time of the ascent. One authority succinctly summarized this concept in his remark, "At least one aspect of aging, the decline of efficiency, can be inhibited by 25 years and

more provided there is systematic and lasting application of suitable physical training." In all instances of this nature, the performer is able to continue in competition because he maintained a training regime despite his advancing years.

Even the individual not interested in sports as a career can benefit from a regular exercise program. Research workers have concluded that exercise can aid in preserving youthful body contours and maintaining organic vigor and the general resiliency of the body. At the other end of the scale, research workers have demonstrated that there is a rapid rate of muscular atrophy resulting from prolonged bed rest and disuse of muscles. Although hereditary factors play their part, there is little doubt that regular physical activity throughout life will delay the onset of degenerative conditions associated with aging.

When one realizes that ever-larger proportions of school children will attain the age of 70 in the future than in the past, it becomes increasingly important that all of them be made aware of the need for continuing an exercise program throughout life. In addition, the amount of time available for leisure pursuits during the working years is continually increasing. Since the manner in which this leisure time will be spent involves a decision by the individual, we can readily appreciate the importance of a high level of mental fitness. Research studies have shown the importance of preparing a person for retirement well in advance of the actual time. While elementary school pupils give little thought to old-age retirement, we cannot question the importance of their early acquisition of attitudes and skills which will give them the beneficial effects of exercise throughout life. This is similar to teaching them the values of brushing their teeth regularly. Good habits of health and fitness not only aid the young in reaching the retirement years, but should enable them to get positive enjoyment in these years. A past president of the American Medical Association has been quoted as saying: "The key to successful retirement is continued activity. For many, it is a hardship, a milestone to mark the beginning of a long or a sudden decline. When a man retires out of life, life retires out of him. To keep physically and mentally fit, action and incentive are essential. Disuse and decay are close relatives."

WHY BE PHYSICALLY FIT?

Often in meetings concerned with physical fitness, the questions are raised, "Fitness for what?" or "Why be fit?" Even the most naïve person recognizes that the demands of jobs, living environments, and recreational pursuits vary considerably and consequently require different levels of fitness. However, these may not remain static, and the ability to adapt to changing demands is certainly a desirable attribute.

Fitness Improves General Health

The relationship between a lack of exercise and numerous disorders has recently been emphasized by competent authorities (General Reference 9). Careful studies of approximately 5,000 patients at the Columbia Presbyterian Medical Center and the Institute of Physical Medicine and Rehabilitation, New York University, have shown that almost 80 percent of those with pains low in the back belonged in the category of muscle weakness or stiffness. In a follow-up study of 233 cases, covering eight years, it was found that the pain symptoms of these patients decreased with improvements in muscle strength and flexibility and that the patients regressed when their therapeutic exercises or physical activities were stopped. In general, a strong parallel existed and continued between muscle status on one hand and pain disability on the other. The lesson obviously is that systematic exercise throughout life offers considerable insurance from pain caused by muscular deterioration and may make unnecessary corrective treatments to restore muscle strength and flexibility.

During the last decade an increasingly large volume of medical literature has appeared which supports the premise that it is desirable from a health standpoint to continue physical activity throughout life. Authorities have given us evidence on the advantages of exercise on the incidence of degenerative diseases, on the inhibition of vascular degeneration, on delaying the onset of the aging, and on one's ability to meet emergencies.

Fitness Contributes to Personal Appearance

Most of us "look better" when physically fit than we do when unfit. This in itself is ample reason for making physical fitness a desirable state. In the case of girls, teachers often must offset the ridiculous notion that exercise which makes a girl physically fit also makes her physically unattractive. When a girl is worried about becoming "muscular" due to physical activity, she should be reminded that some of the prettiest women in the last Olympiad were the gymnasts. And this sport cannot be classified as a light activity. Most motion picture idols are sensitive to the need of maintaining their physical fitness, and they spend considerable money to keep up their appearances. The trim, well-groomed body is a thing of beauty; an overstuffed adult is not.

Fitness Results in Weight Control

It has been demonstrated that exercise is an important method of reducing weight. Studies at Harvard are among those which have dispelled the erroneous idea that exercise requires little caloric expenditure and is consequently ineffective in changing the caloric balance. Some have been led to believe that to lose a pound of fat requires the equivalent of splitting wood for seven hours, and the inference is that this must be accomplished in one stretch. If the wood is split at the rate of half an hour a day, in the course of one year the caloric equivalent would be equal to 26 pounds of body fat. This loss would be substantial and would be in line with the way body weight is added. A person doesn't become overweight overnight. When we lose weight gradually, we are more apt to stay at the new level than if we lost weight through a crash program of 10 or 15 days. The same rule holds for any physical activity.

Even a cursory examination of life insurance statistics relating overweight with the incidence of various diseases and life expectancy leaves no doubt of the value of weight control. One analysis revealed that moderate overweight produces a 40 percent higher than normal risk and excessive overweight yields a 70 percent higher death rate than normal. In examining modes of weight reduction, the individual has two primary alternatives, to decrease the food intake or to increase the amount of ex-

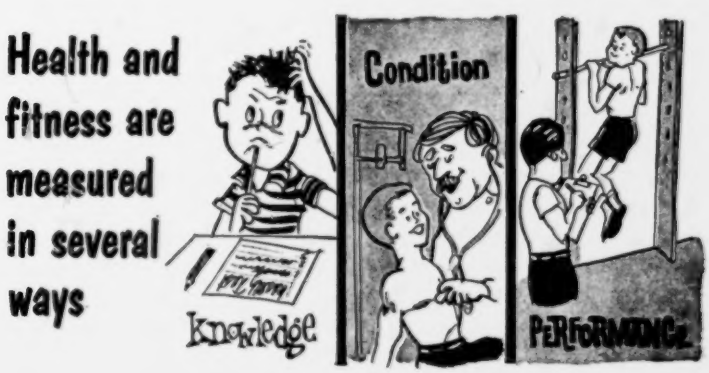
ercise. Both will contribute to the desired objective. Recent studies of animals, however, indicate that weight lost through exercise seems to be more lasting than weight lost through dieting alone.

The disadvantages of being overweight, namely, (a) inconvenience, (b) disfigurement, (c) inefficiency, (d) predisposition to functional diseases of the circulatory system, and (e) shortened life expectancy, should convince the recalcitrant that this is not a desirable state.

While appearance is important, the physically fit person also has the advantage of having more energy available for free-time activities. He is not too exhausted to enjoy hunting, fishing, golf, swimming, or any other pursuit which appeals to him. Many of these pastimes have significant mental therapeutic values, to say nothing of their physical contributions.

THE MEASUREMENT OF PHYSICAL FITNESS

Although a single definition for physical fitness is not available, many tests have been developed which measure some components of fitness. One could subdivide these into two categories—those tests taken in the resting or quiet state and those taken with the subject going through physical performances. Both have value.



Measuring Physical Status

Under the first caption, such factors as the presence of pathology, the subject's weight, body build, vision, hearing, and posture would be tested. In general, most medical examinations would be in this category. Ideally, the point of departure for any fitness program is the medical examination. Since all physical fitness programs involve physiological stress, it is imperative that the absence of pathology be confirmed prior to strenuous physical activity. The determination of physical condition is a task for the physician.

Every effort should be made to maintain close liaison between the school physician, the family physician, and those responsible for the physical education program. While isolated research studies have cast some doubt on the value of the cursory, annual medical examinations often given school children, most health authorities still favor reasonably detailed periodic examinations. Almost all agree that the classroom teacher and the school nurse are in a strategic position to note conditions which should be referred to a physician. Whether the examination is by the school physician or the family physician, the necessary facts on an unusual condition should be made known to the teacher. The classroom teacher is not responsible for diagnosis of and decisions on a student's health status, but the teacher must be advised how the child's health status is to be related to the physical fitness program.

The periodic weighing of students is frequently the part of a medical examination accomplished by the classroom teacher or the school nurse. The record of weights can be compared with the norms for the age and sex. When careful records are kept, the teacher can note when individuals gain or lose pounds. Any appreciable loss of weight in school children should be reviewed with suspicion, and, if there is no apparent reason for it, the case should be reported to the parents and the school physician. When children participate in such record keeping, they often become sensitive to the importance of sensible weight control throughout life. Attention can be given also to the interrelationships between rest, exercise, and food intake as they are related to health and physical fitness.

When measurements are made of the student's body weight, some estimate also should be made of his muscle tone plus the bone, muscle, and fat proportions. This information is useful in interpreting weight. The student with large, heavy bones and muscles (the mesomorphic or athletic type) will be considerably heavier than his counterpart of the same age and height with ectomorphic (linear) characteristics. While weight tables are divided into categories of skeletal structure, the extreme body types are penalized by the tables. Judgments of a youth's weight in relation to the tables should be tempered by the notions of muscle and bone structure.

Unfortunately, many classroom teachers ignore the posture of their students. The aesthetic value of good posture is in itself sufficiently significant to warrant attention. The student with good posture "looks better" than his counterpart with poor posture. Ask students to observe the postures of their idols among the Hollywood stars, beauty queens, and TV performers. Such examples of good posture are not universal among the general population. Sample surveys of the population reveal the need for posture and corrective work at all age levels. The proportion of individuals needing special attention varies between 50 and 70 percent of the sample.

There is now wide acceptance among specialists that there is a close relationship between poor body mechanics and back pain or malfunction. That poor posture is a needless expenditure of energy cannot be questioned. The classroom teacher can aid children in learning how to walk correctly, with the toes pointed straight ahead or in a nearly straight position. Simple checks of posture while standing, walking, and sitting will do much to alert students to what is good posture and to what constitutes undesirable deviations. It is virtually impossible to make a case for poor posture. (Techniques for evaluating posture will be found in citation 10 of the General References.)

Measuring Physical Activity

While the previously mentioned tests of physical fitness are necessary, teachers are also concerned with "people in action." Body movement is the *essential element* in physical education. Tests which indicate how well the boy or girl is able to function

are indispensable when evaluating physical fitness. The teacher of physical education, in particular, is interested in knowing how well the student can run, jump, throw, and climb. These activities are expressions of strength, endurance, speed, agility, and neuromuscular coordination of the student. They represent the vehicles for achieving the various objectives of physical education.

In the development of physical fitness tests over the years, common practice has been to fractionate the components of fitness or parts of the body and design tests for each part. An examination of the tests and measurements literature would yield a pattern similar to that outlined in Table 1.

The teacher seeking a test of physical fitness should have little difficulty, since a number of agencies, both government and private, as well as individual research workers have developed test batteries. Listed on page 33 are selected tests that have appeared in the measurement literature during the past quarter century.

The AAHPER Youth Fitness Test has been given to approximately 25 million boys and girls between grades 5 and 12. The test battery constituted the basis for the first nationwide survey of youth fitness in the history of the national organization. As was previously mentioned, the norms have been used for comparative purposes by research workers in Great Britain, Japan, Hawaii, and Denmark. The Youth Fitness Project served another useful purpose in orienting scores of teachers to the use of tests in physical education.

Recent research studies conducted in selected locations of the United States by the President's Council on Youth Fitness and using the AAHPER Youth Fitness Test have dramatically demonstrated the effect of an intensified physical education program on fitness test scores. In a matter of eight weeks it is possible to raise the over-all fitness level of high school students through a systematic program of physical activities.

Although the norms for the AAHPER test battery are approximately five years old and there are indications that they are too low, one must remember that they were based on a nationwide sample of school children. Many of these students were not enrolled in physical education classes, and none of the

testees had any chance to practice for the tests. Plans are currently being formulated to take another nationwide sample and change the norms if the results indicate this to be necessary.

TABLE 1. Physical Fitness Components and Tests

Component	*Selected Tests*•
1. Arm and shoulder strength	Pull-ups, push-ups, parallel bar, dips, rope climb
2. Speed	50-yard dash, 100-yard dash
3. Agility	Shuttle run, agility run
4. Abdominal and hip strength	Sit-ups, sit-ups with knees flexed, 2-minute sit-ups
5. Flexibility	Trunk flexion standing, trunk flexion sitting, trunk extension (prone position)
6. Cardiorespiratory endurance	600-yard run, half-mile run, mile run, 5-minute step test
7. Explosive power	Standing broad jump, vertical jump
8. Static strength	Grip strength, back lift, leg lift
9. Balance	Bass test, Brace test, tests on balance beam
10. Muscular endurance	Push-ups, chest raisings (prone position, hands behind neck, legs held down), V-sit (against time)

•Norms for many of these tests appear in the citations on tests and measurements and the articles in the Selected Research References, p. 30

A Few Cautions on Measurement

Virtually none of the short test batteries (three or four test items) will adequately measure all the components of fitness. However, this does not mean the tests are useless. A similar situation exists in the field of medical examinations. The average medical examination for insurance purposes may be less search-

ing than the type of probing and clinical analyses characterizing the complete examination given at a hospital. Both examinations have value, but in the first instance the doctor would have to preface his remarks regarding the patient's state of health with caution because of limited information available. Time, money, and need may limit the type of medical examination given. Administrative considerations of this kind also have to be considered in the development of a physical fitness test. The physical fitness tests developed for the armed services during World War II met the demand for a short test to be given to an overwhelming number of testees and the need for tests requiring little or no equipment. Useful tests were developed, but they have limitations. The important lesson for the teacher is *to know what a given test measures and to limit his conclusions to the information obtained.*

In selecting tests the teacher should include tests which the student can take by himself or with the aid of a partner. These tests permit out-of-class practice sessions and encourage the student to take part in physical activities. Studies have shown that many of the fitness test scores can be improved as much as 100 percent in two months.

The teacher also should have some orientation regarding the use of test norms. Despite what a few teachers think, pupils as well as parents are interested in knowing how their performance compares with a peer group. In fact, when Johnny finishes a test he frequently asks, "How good is that?" What he really wants to know is how does his performance compare with that of other boys. It is fallacious to argue against the use of norms on the grounds that "people are different." Without reference to norms how would such terms as "overweight," "high blood pressure," "slow reader," "high IQ," "accelerated mathematics," and "poor condition" find their way into our language? The 4-minute mile, the .300 hitter in baseball, the 20-game winning pitcher, the climbing of Mount Everest are all significant because they represent performance well above the norms. How else can the teacher determine the specific strengths and weaknesses of a student?

While the typical student is interested in comparing his score with others, he should be encouraged to compare his score with

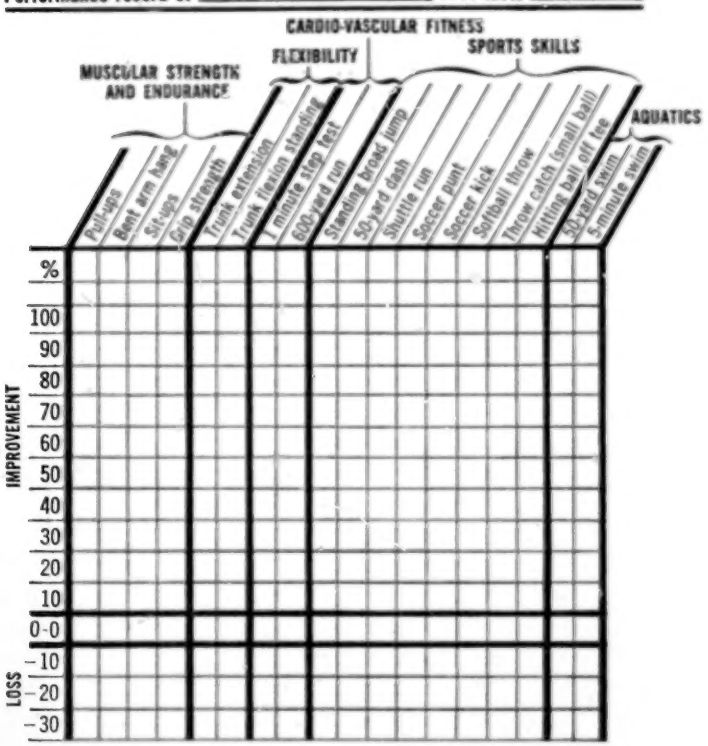
his own previous performance. The lure of competing against oneself is obvious from the number of golfers or bowlers who strive continually to break the previous scores they have made. An encouraging aspect of physical fitness stems from the fact that the vast majority of people can improve if they are willing to apply themselves.

Even though norms and standards serve a real function and are useful in teaching individuals, a word of caution regarding their use is appropriate. Do not set standards for a young person that are virtually impossible for him to meet. The result may be frustrating and could be mentally or physically harmful. Students should be stretched but not snapped. Because of the physical involvement in fitness activities, it is particularly important that the safety and health of school children be guarded through the careful selection of challenging yet realistic goals and learning experiences.

The measurement of physical fitness is an obligation of the teacher of physical education. It is equally important that systematic records be kept, even if the student himself maintains the record. The record form should provide space for entering periodic tests results so that the student has a longitudinal record of his changes in fitness. In addition to keeping the student posted, the parents also should know how their child is progressing. The composite record of all students should be compiled annually for the principal, the superintendent, health experts, and others concerned with development of the curriculum. If this systematic study of procedures and results is made over a period of years, physical education will take its rightful place in the total educational plan.

The value of a report form to parents was clearly demonstrated in 1959 when a rather extensive report was sent to parents of children enrolled in the University School Summer Youth Fitness Program at The University of Michigan. A modified form of this final report is shown on page 20. This type of report serves the following important functions: (a) emphasizes that the program is *instructional* and not just a play period; (b) points out what is being taught; (c) indicates a youngster's performance in relation to his peer group; and (d) indicates the changes in performance occurring during the time of the program.

Performance record of _____ Date of first tests _____



Aquatic Skills: Successfully performed____ stunts for rating of_____

Gymnastic Skills: Successfully performed____ stunts for rating of_____

Explanation: The cells marked 0-0 (outlined in heavy lines) indicate the boy's score at beginning of program. These cells are color-coded as follows: GOLD—Superior; BLUE—Above average; RED—Average; GREEN—Below average; and BLACK—Poor.

The Boy's improvement (or loss) is calculated in terms of percent with his initial score as a base:

$$\text{Percent change} = \frac{\text{Final score} - \text{Initial score}}{\text{Initial score}} \times 100$$

The location of the colored dot (lower border) indicates the percent of change according to the scale at the left of the chart. The color of the dot indicates the classification on the final test according to the above color categories. **(Based on record form, University School, University of Michigan.)**

PREREQUISITES TO PHYSICAL FITNESS

After a student has had a medical examination and is declared free of disease, the attainment of a high level of physical fitness rests on three things: adequate sleep, good dietary habits, and sufficient physical exercise. A disregard of any one of these makes the fitness goal unattainable.

Rest Often

While the amount of sleep necessary varies from childhood to old age and in general decreases as we get older, it is fairly safe to assume that if the youngster wakes up in the morning refreshed and ready for the day's activities, he has had sufficient sleep. Young children (kindergarten and early elementary grades) may require additional afternoon rest periods. If a child does not recuperate from seemingly adequate hours of sleep, his problem should be referred to a physician. Most children, if given sufficient physical activity, will be ready for bed and will have no difficulty sleeping. In school, additional demands on the energy reserve of youngsters should be compensated for with extra rest periods. This principle is followed in many summer camp programs where the physical demands are generally greater than during the school year. Camp directors usually insist on a rest period following the noon meal.

Eat Right

Since preparation of a child's meals is not under the supervision of the classroom teacher, his role must be an indirect one in this area. In addition to sensitizing the student to the need for controlling his weight, the teacher can make sure that his class knows what constitutes an adequate diet. Details on nutrition and diet can be obtained from sources in the bibliography (see General References).

Exercise Regularly

The classroom teacher can exert considerable influence on the matter of physical exercise. Youngsters are by nature active, and they are happier if moving than when forced to sit quietly.

If a group of students is taken out to a track and given no direction at all, some will start running around the track. Likewise, if a group is taken to a gymnasium and left without direction, a few will start shooting baskets, others may climb on apparatus, and still others may wrestle. The desire for physical activity is a well-known natural craving. However, without instruction, supervision, and supervised practice sessions, most youngsters merely expend energy without learning much or advancing their skill levels. The role of the teacher in the development of physical skills and, more important, in the development of attitudes toward physical exercise cannot be overemphasized. While it is recognized that a few physically gifted youth attain high levels of performance with little direction, it is equally obvious that a skilled teacher can exert tremendous influence in creating a desire to take part in sports. Skilled teachers of physical education can be especially influential.

We can state categorically that no young person will attain a desirable level of physical fitness without taking part in sports and/or exercise. *This is a must.* And it can be further stated that the more vigorous sports or exercises will develop a higher level of physical fitness than the less vigorous. To reiterate a previous statement, "The key to greater energy reserve is through energy expenditure."

More than Sports and Games

While many sports are excellent recreational pursuits, participation in these may add very little to one's physical fitness level. Table 2 classifies a number of sports and exercises in terms of their potential contribution to physical fitness. Close scrutiny of the sports commonly played in American schools indicates that few make any contribution to arm and shoulder strength. The fact that this region of the body is generally weak in our school children is common knowledge among the teachers of physical education. Many new gymnasiums do not have chinning bars, horizontal ladders, ropes, or heavy apparatus. In fact, when the American Association for Health, Physical Education, and Recreation Youth Fitness Project was being conducted, the test item "pull-ups" was most difficult to administer

because of a lack of equipment. Most ball games will not strengthen the arms and shoulders. The student must lift weights, wrestle, or take part in a sport where he is supporting his body weight with the arms and shoulder muscles. Rope climbing, apparatus work (particularly the rings and side horse), and exercises on a horizontal ladder are examples of arm and shoulder strengthening activities.

TABLE 2. Contributions of Selected Sports and Exercises to Physical Fitness

High	*Moderate*	*Fair*	*Poor*
Apparatus	Baseball	Archery	Bowling
Badminton	Calisthenics-light	Golf	Croquet
Basketball	Dodgeball	Hiking	Dancing-ballroom
Boxing*	Ice skating-figure		Horseshoes
Calisthenics-heavy	Relay games		Shuffleboard
Dancing-modern	Softball		
Fencing	Tetherball		
Field hockey	Track-sprints, field		
Football	Volleyball		
Handball			
Ice hockey			
Ice skating-racing			
Judo			
Rebound tumbling			
Rope climbing			
Rope skipping			
Skiing			
Skin diving			
Soccer			
Squash racquets			
Swimming			
Touch football			
Tennis			
Track-distance			
Tumbling			
Water polo			
Weight lifting			
Wrestling			

* Boxing competition is barred in many schools.

Discussion of the physical fitness contributions of selected sports requires brief notice of the effect of skill level on fitness values. During one summer school program, portable recorders on the field, in the gymnasium, and near the swimming pool were used to collect data on heart rates. As was anticipated, the heart rates differed with activities, but it also became apparent that there was a wide variance in rates between pupils taking part in the same sport. Tennis to the beginner imposes one type of stress, but to the advanced player the physiological demands can be considerably greater. The teacher must take into account these differences when counseling students and helping them set their own fitness goals.

CHALLENGES ARE NECESSARY

High school teachers of physical education can seldom be criticised for failure to challenge their physically gifted students. The competitive interscholastic sports program takes care of this. However, there is some question regarding the challenge in programs for the nonathletic youngster (and in the offerings at the elementary school level). In far too many instances the activities offered are not in line with the child's neuromuscular development. This is the Great Sahara of physical education.

Activities Related to Age Interests

During his early years the child is most receptive to play activities. Knowing this we often neglect teaching the motor skills necessary for participation in physical education programs. In actual fact, even the elementary school child is capable of mastering highly complex motor skills. Systematic instruction can be successfully given in such activities as swimming, skiing, handball, gymnastics, tennis, badminton, soccer, softball, speedball, touch football, volleyball, wrestling, and track and field. Rules or equipment may have to be altered to suit the age level, but these changes do not detract from the value of the sport. We should remember that, in general, sports rules are written for the champion, and it is folly to follow them blindly. A youngster can enjoy a baseball game even if the bases are not the standard 90 feet apart.

Despite limitations of facilities and space, it is possible to teach many of the lead-up games associated with the previously mentioned sports. The teacher should know that most children, by 10 years of age, have the neuromuscular potential to master the skills required in practically any physical education course currently offered at the college level. In many instances the rate of learning is faster at the younger ages. These statements do not mean that an elementary pupil could pass the college level course, since he might not have the necessary strength or size. He does have *potential* of mastering the neuromuscular skills. The requirements of a course in beginning swimming can be mastered by a six-year-old. All through the elementary and secondary program, our young people could learn numerous other skills. If this were done they would have more free time to practice these skills than they would have later in college. Practice is the *indispensable* element in the mastery of motor skills.

Activities Related to Physical Needs

In line with challenging a student, the teacher of physical education is indeed fortunate to have so many activities from which to make choices. But first, one must evaluate the student's physical aptitudes, limitations, and needs so as to suggest activities which are most appropriate. You can waste a good deal of massage and liniment getting a draft horse ready for the Kentucky Derby!

It is quite obvious from research studies in motor learning that children do their own learning within the structure of their individual capacities and limitations. The teacher merely provides the setting or stimulation for the experience. With this in mind, the teacher needs first to know what is available and the requisites for successful participation. Secondly, one must know the student's strengths and weaknesses so as to provide the challenging experiences which offer the student a chance for success within his particular capacities and limitations. Forming such judgments is by no means a small assignment. With many choices of physical education activities and with demands from all youngsters, regardless of their academic status, the teacher has few restraints upon the challenges he can offer through the physical education program.

PROGRAM PLANNING FOR PHYSICAL FITNESS

The text to this point has indicated that many activities contribute to physical fitness. However, there are a few common denominators of fitness programs which need to be given special emphasis:

1. Have a planned program and do not leave things to chance.
2. Muscles will not grow stronger unless they are overloaded (that is, an intensity above that customarily used).
3. Sports and/or exercise tasks should be increased in amount as the fitness level improves.
4. Sufficient rest between sports or exercise sessions should be allowed so the student makes a full recovery (to avoid the possibility of developing a state of chronic fatigue).
5. Sports and/or exercises should involve running, jumping, throwing, climbing, hanging, and weight-supporting activities which in essence develop the various components of fitness (that is, strength, endurance, flexibility, etc.).
6. The goal should be attractive enough to hold a high priority in the student's value system. Boys will frequently "get in shape" so as to perform better in a sport. Girls should be convinced that fitness makes them more attractive, not less so.
7. An intensive exercise program carried out over several months exerts opposite effects on the physique of extremely obese and extremely lean individuals. Normalization of growth and development occurs.
8. Daily participation in sports and/or exercise is necessary for the development of a maximum level of physical fitness.
9. Students have different capacities for exercise, but to improve a level of fitness they must be pressed.
10. Many activities can contribute to a person's physical fitness, but all make heavy physiological demands.
11. Introduce new physical activities each school year so the students have something to look forward to.
12. Give the students challenges which can be practiced during the after-school hours and periodically test them on their progress.

In the development of programs for fitness, it is helpful to have numerous self-testing stunts for the pupil so he can see improvement. Physical education activities lend themselves to this type of motivation. Many skills can be measured with a tape or stop watch. Many of these can be geared to any age or performance level with a minimum of imagination.

The level of performance of sports skills has a bearing on the contribution to fitness. The teacher must realize that the development of a high level of performance takes considerable time and practice. Virtually all top-flight athletic performers had to devote countless hours to practice. While few of our students will become champions, sufficient time should be allowed for the development of a reasonable level of skill. In general, the participant enjoys a sport more if he is able to perform satisfactorily. One must not overlook the simple fact that when a motor skill is mastered it becomes part of the person's neuromuscular make-up and that the retention of the skill is much greater than retention of certain attributes of fitness. The youngster who has learned to swim is never again a nonswimmer. This fact is a good reason why young school children should be exposed to a variety of sports instruction. Once the skills are mastered, they are available for future participation. And let's face it: the youngster has more time to devote to these pursuits and, biologically speaking, should get more physical activity than the older person.

PHYSICAL FITNESS OF TEACHERS

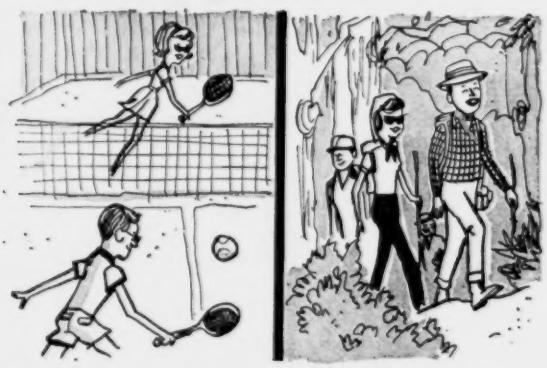
In urban school systems teachers often are required to take a medical examination as part of the screening and selection process for appointment. In many instances this represents the only medical examination required regardless of the length of employment. While it is highly desirable to know whether any disease is present, the over-all efficiency of the teacher depends on more than just "freedom from disease."

Although there is a paucity of evidence specifically relating the maintenance of a high state of physical fitness and teaching efficiency, there are strong suggestions in the research literature pointing out the relationship between participation in

regular exercise and the delay in the signs of aging. The problem is not simply a matter of how long the teacher lives, but whether he has the energy and drive to continue being effective throughout his active career.

When one thinks of the specific demands required of a teacher of physical education, it should be quite obvious that physical fitness is a must. Since one of the prime objectives of the profession is the development and maintenance of physical fitness, it is ludicrous for someone with Falstaff's body proportions to be teaching fitness. He may have a place in a Shakespearean production, but not as a teacher of physical education. Research studies in motor learning have clearly demonstrated the value of the demonstration when teaching physical skills, particularly in the early stages of learning. The teacher must be fit and must possess sufficient confidence in his motor ability to demonstrate skills.

Teachers also should practice fitness



Each teacher should take stock of his own state of physical fitness and recognize the simple fact that improvement is not only possible, but desirable. As is the case with anyone else, the program should start with a medical examination. When it is clear that no limitations upon exercise are required, a program of regular exercise, sufficient rest, and proper diet should be started and continued throughout life. While physical fitness requires one's attention for a lifetime, as little as 15 minutes of exercise a day can be sufficient for the maintenance of physical fitness.

NEEDED RESEARCH

Even though there has been a recent interest in physical fitness, as evidenced by a veritable plethora of popular articles on the subject, there is a paucity of profound research dealing with selected facets of the problem. The following problems, listed without any thought of priority, should be fruitful channels for physical fitness research:

1. Studies of the mechanisms responsible for increasing strength and endurance through training. These would probably have to be done at the cellular level. Muller and Hettinger, as well as others, have indicated that strength can be developed in a relatively short time.
2. Studies designed to cast light on when children are physically and psychologically ready for certain sports. There is general agreement that current programs are not sufficiently challenging.
3. Studies of the amount of physical activity that is desirable at various ages for maintaining physical efficiency at a high level.
4. Longitudinal studies to identify and explore the contributions of a regular exercise program to health. Jokl has contributed to our understanding of this problem.
5. Studies to determine techniques for motivating a desire for and proper attitude toward fitness.
6. Studies of the physical fitness of today's population to serve as a record for future comparisons. The AAHPER survey was a start.
7. Studies to identify activities which develop high levels of fitness in the shortest time.

SUMMARY

In recapitulation, it can be stated that the potential for a high level of physical fitness in our youth is present, but comparative studies indicate a need for further development. Physical fitness is more than freedom from disease. The added energy reserve of the fit person is important because it enables him to participate in many enjoyable pursuits.

A person is more attractive when fit than when unfit. Physical fitness is a lifetime proposition, and a fitness program can be started at any age level. Physical fitness can and should be measured, and the pupil should be apprised of his level of fitness.

Programs for developing physical fitness must take cognizance of three factors: rest, diet, and exercise. Many activities contribute to the development of physical fitness, and all that make a significant contribution involve a high energy expenditure.

Programs for developing physical fitness should be planned and should be both challenging and geared to the needs and capacities of the students. All teachers should do something about their own state of fitness.

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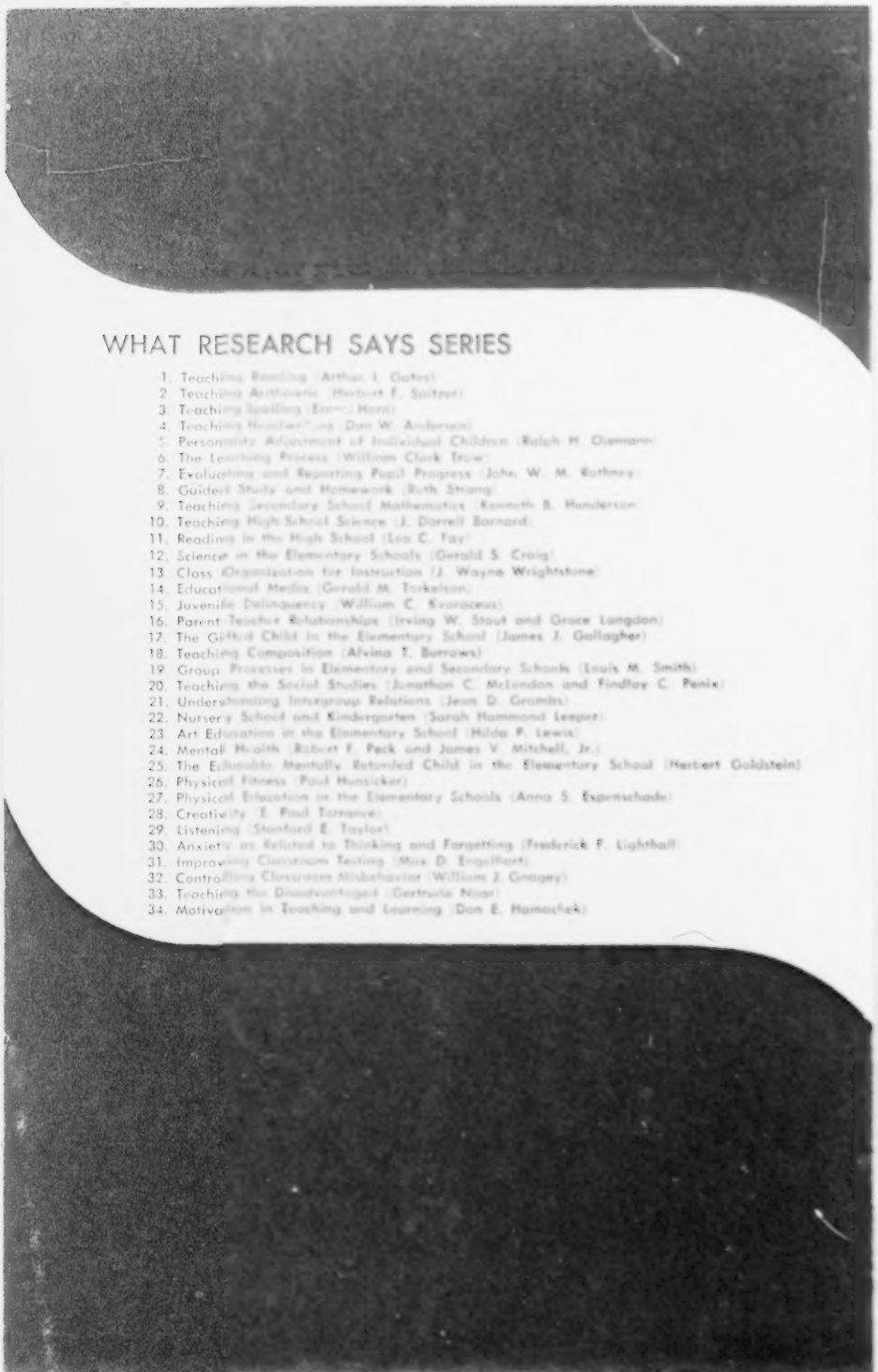

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